Total Force Structure Analysis

Innovative Management Concepts

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Briefing Outline

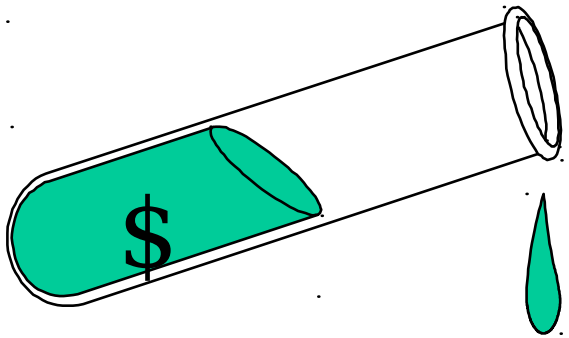
- Purpose and Advantages
- Examples
- Basic Concept
- Information Systems
- Future Development/Uses

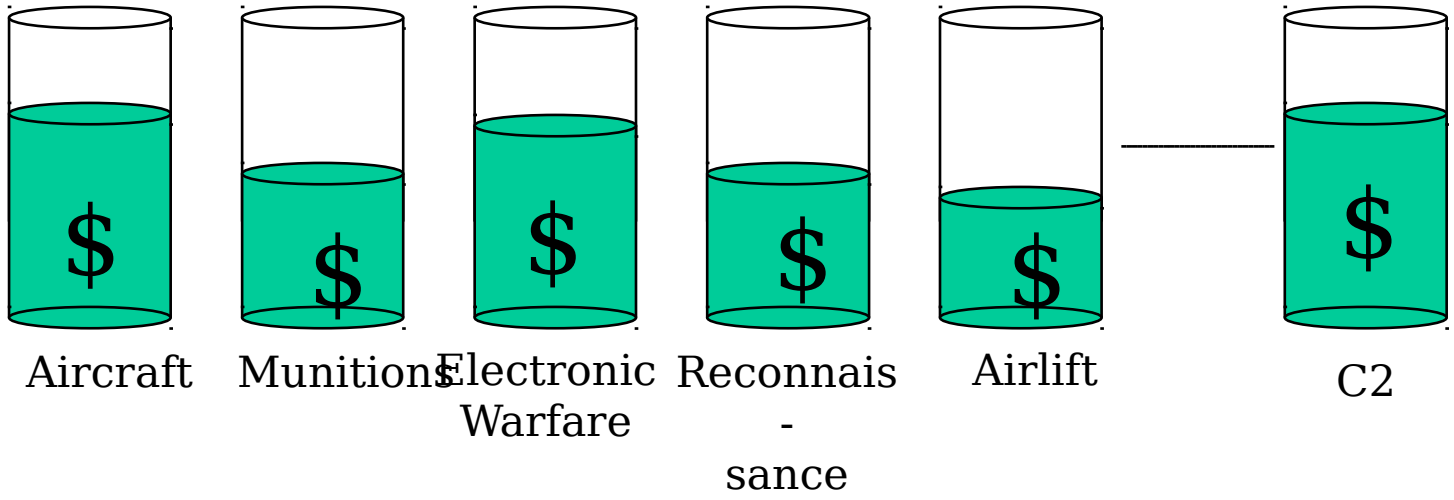
Purpose of this briefing

Describe an analytical process for studying force structure options and a mathematical program (model) that is an essential element of the process

Obtain your views on what should be n

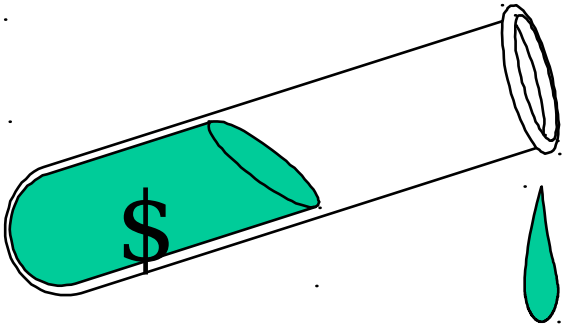
process:
to remove “stovepipe”
funding analysis

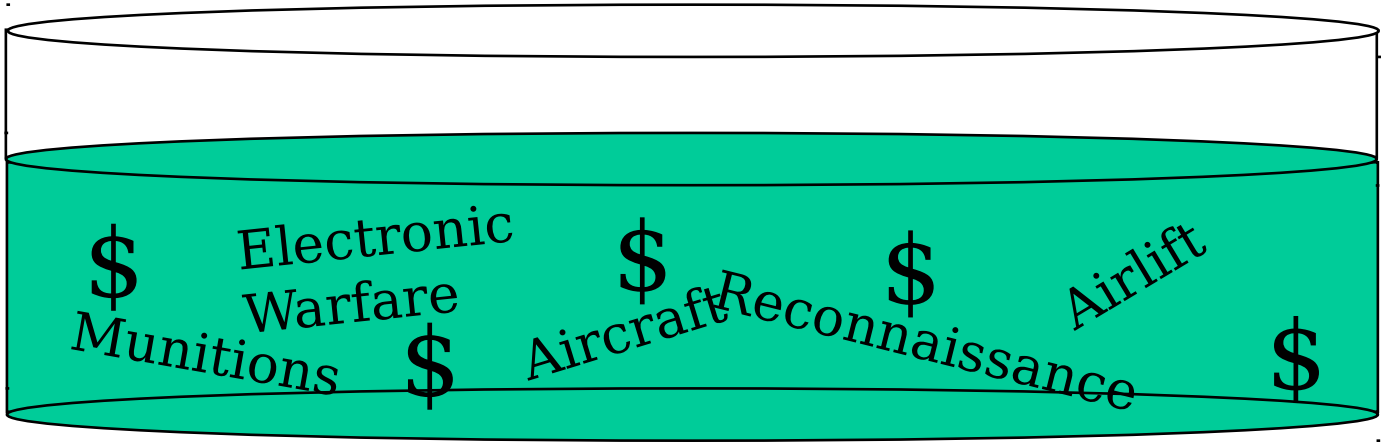




process:

analyze major systems and units simultaneously





Major Advantages Over Other Processes

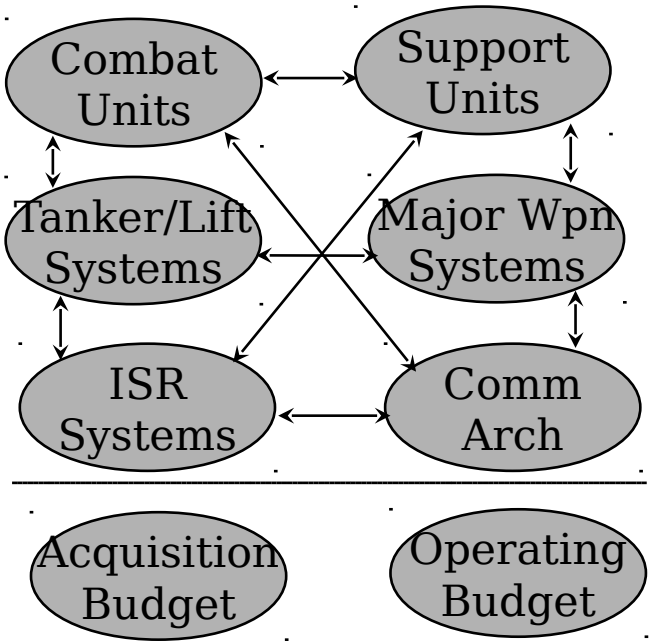
- A process that simultaneously assesses systems across many mission areas, includes support systems and **information systems** (e.g. C4ISR)
- A process that is **directly linked to the Concepts of Operations** in each theater and will identify the force structure based on variations in the Concepts of Operation
- A process that is **task based** and can be directly linked to the UJTL and Service Task Lists

Basic Concept: Step 1

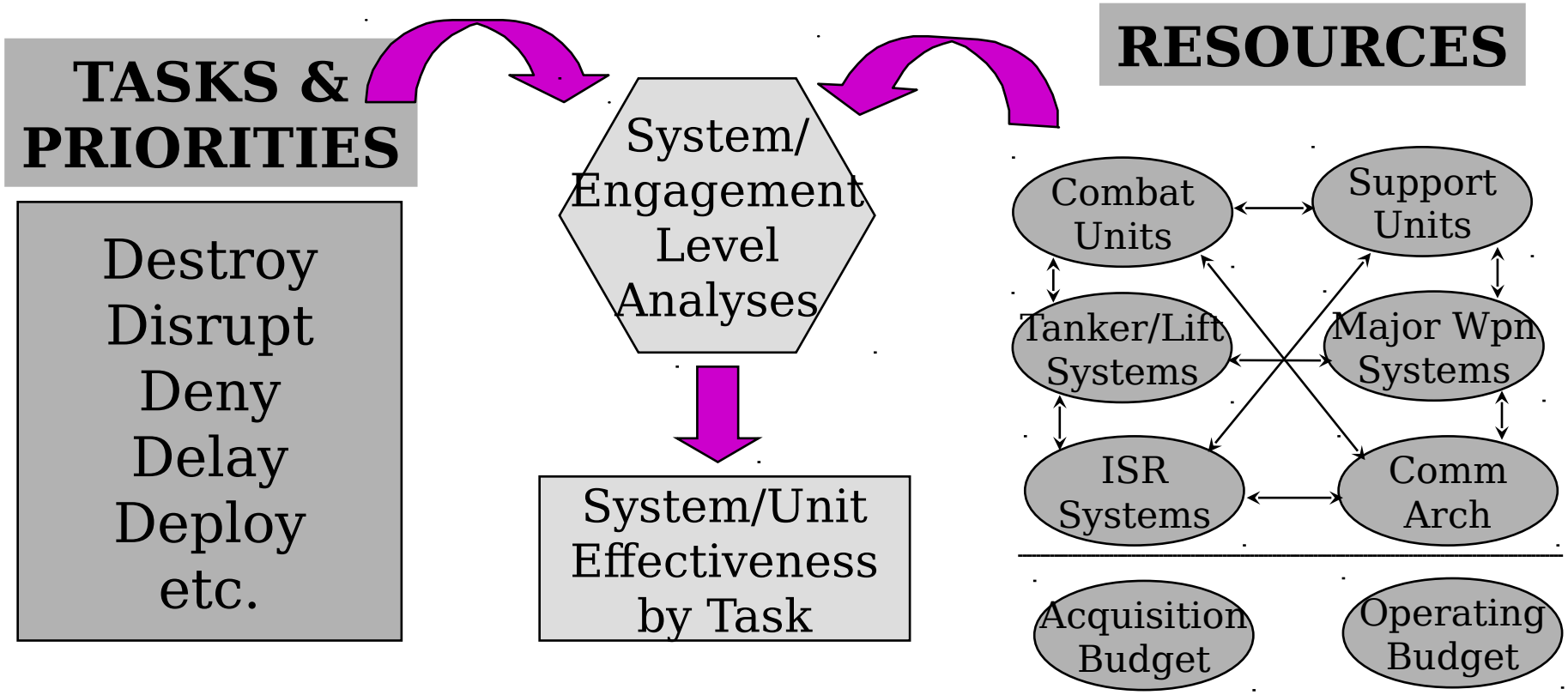
TASKS & PRIORITIES

Destroy
Disrupt
Deny
Delay
Deploy
etc.

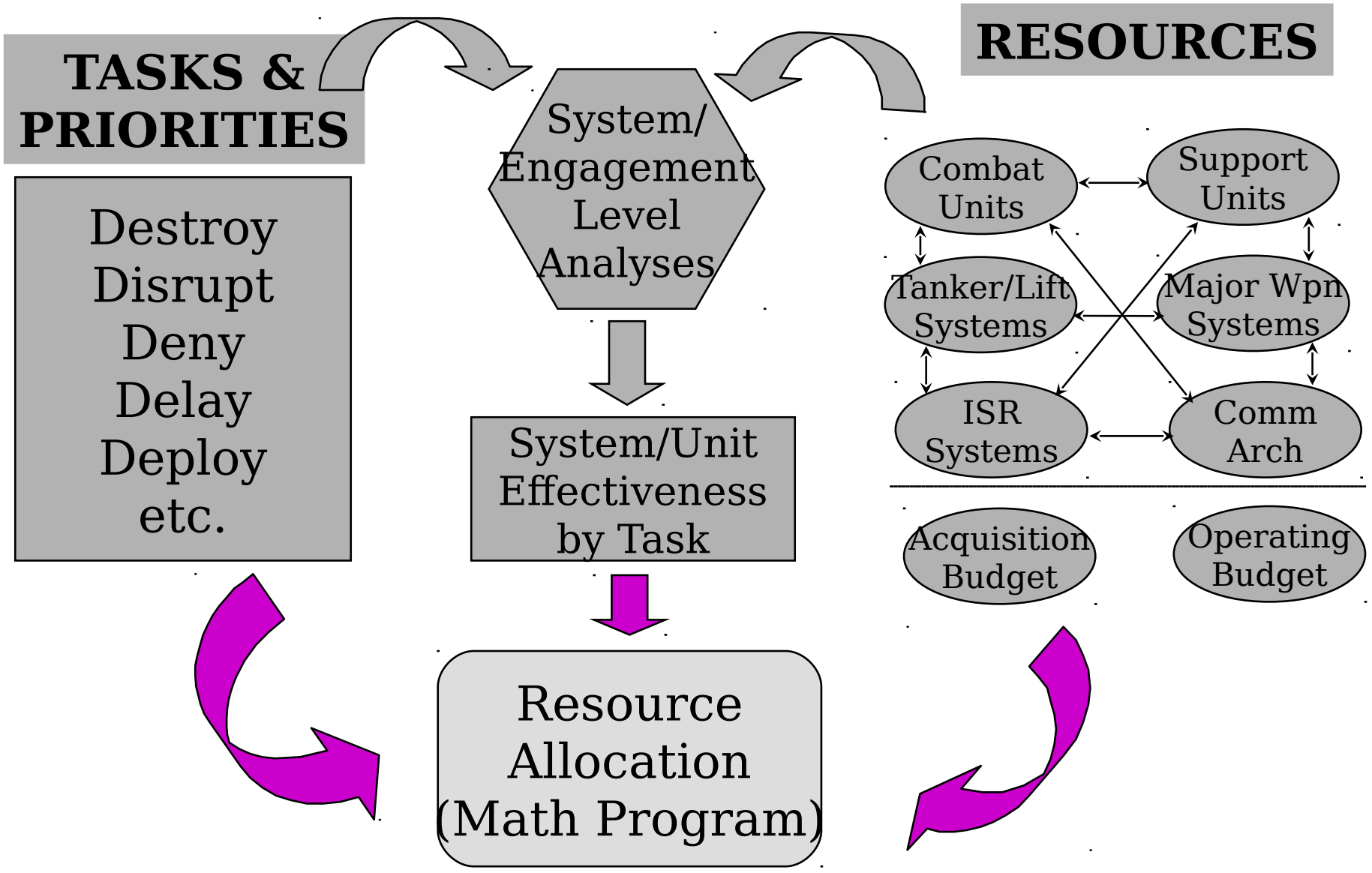
RESOURCES



Basic Concept: Step 2



The Basic Concept: Step 3



Example: Small/Notional Database

Tasks & Priorities

9 Destroy Tasks
9 Surveillance Tasks
4 Peacekeeping Tasks

Effectiveness & Resources Consumed per Task attempt

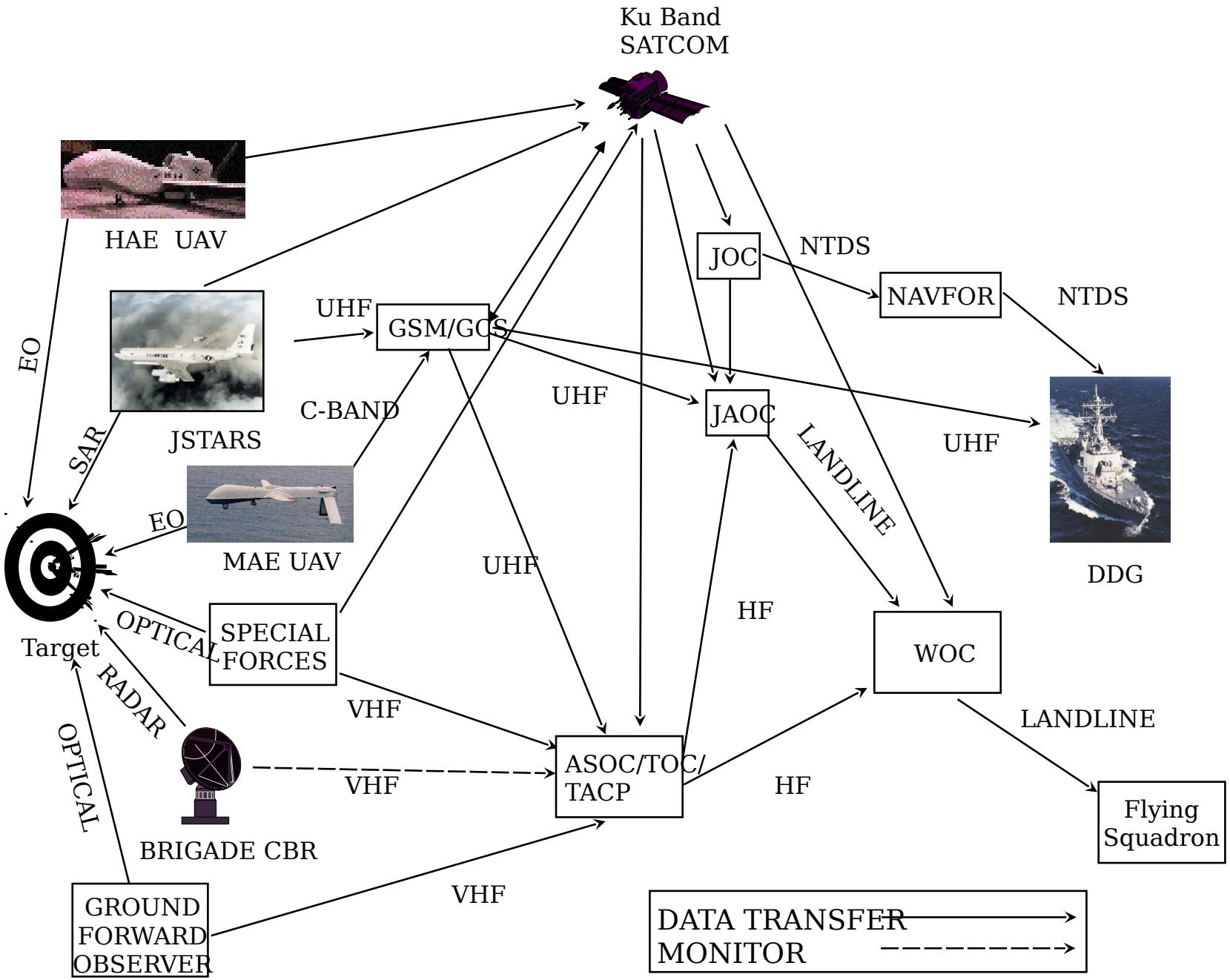
Resources

2 Aircraft
3 Munitions
2 Cruise Missiles
3 Battalions

8 Comm Nodes
25 Comm Links
Systems
2 Lift Systems

Miscellaneous Data

existing systems
cost per system
aircraft sortie rate and loads
comm node and link capacities


Ku Band
SATCOM
HAE UAV
JSTARS
MAE UAV
Target
EO
SAR
EO
C-BAND
UHF
GSM/GCS
JOC
NTDS
NAVFOR
NTDS
UHF
JAOC
UHF
LANDLINE
UHF
DDG
UHF
HF
WOC
LANDLINE
Flying
Squadron
SPECIAL
FORCES
OPTICAL
RADAR
OPTICAL
VHF
VHF
ASOC/TOC/
TACP
HF
BRIGADE CBR
GROUND
FORWARD
OBSERVER
VHF
DATA TRANSFER
MONITOR

Base Case

Existing Systems

72	F-15E
72	F-16
400	TLAM-C
400	TLAM-D

Systems Bought

39	F-15E
5	JSTARS
9	PREDATORS
49	GLOBAL HWK
15	LIFT SYSTEMS

Value of Tasks Completed

1,577,690

Base Case + Excursion #1

Global Hawk P(discrim) > 30%

Systems Bought

Base Case	Excursion #1	
38	39	F-15E
4	5	JSTARS
9	9	PREDATORS
56	49	GLOBAL HWK
16	15	LIFT SYSTEMS

Value of Tasks Completed

Base Case	Excursion #1
1,577,690	1,694,476

Base Case Excursion #1

#1&2

Global Hawk P(discrim) > 30%
Budget > 50%

			Systems Bought	Value of Tasks Completed
160	38	39	F-15E	1,577,690
5	4	5	JSTARS	
242	9	9	PREDATORS	1,694,476
89	56	49	GLOBAL HWK	
18	16	15	LIFT SYSTEMS	1,694,608

Base Case Excursion #1 Excursion #2

Base Case + Excursion #3

Global Hawk/SATCOM Link < 80%

Systems Bought

22	39	F-15E
22	5	JSTARS
7	9	PREDATORS
15	49	GLOBAL HWK
11	15	LIFT SYSTEMS

Value of Tasks Completed

1,577,690	
	1,422,361

Base Case Excursion #3

Base Case + Excursions #3&4

Global Hawk/SATCOM Link < 80%

Budget >50%

Systems Bought

106	22	39	F-15E
32	22	5	JSTARS
243	7	9	PREDATORS
29	15	49	GLOBAL HWK
13	11	15	LIFT SYSTEMS

Value of Tasks Completed

1,577,690

1,422,361

1,550,576

Base Case Excursion #3 Excursion #4

Base Case + Excursion #5

All KuBand Links < 50%

Systems Bought

20	39	F-15E
14	5	JSTARS
5	9	PREDATORS
42	49	GLOBAL HWK
13	15	LIFT SYSTEMS

Value of Tasks Completed

1,577,690	
	1,301,189

Base Case Excursion #5

#5&6

All KuBand Links < 50%

Budget >100%

Systems Bought

166	20	39	F-15E
33	14	5	JSTARS
355	5	9	PREDATORS
79	42	49	GLOBAL HWK
19	13	15	LIFT SYSTEMS

Value of Tasks Completed

1,577,690

1,301,189

1,477,897

Base Case Excursion #5 Excursion #6

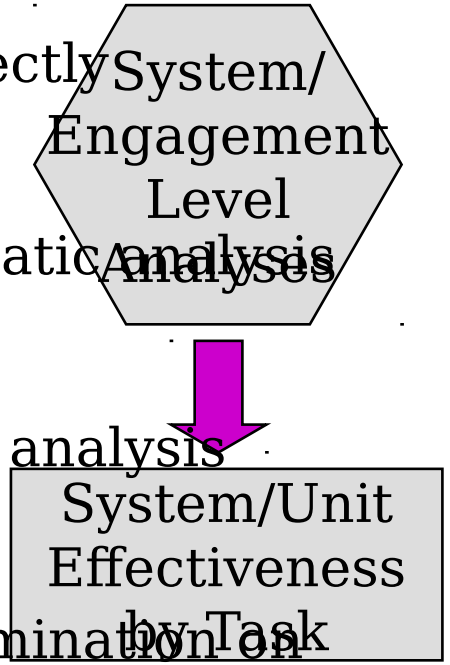
The Basic Concept: additional advantages

System developers must tie their analysis directly to the UJTL and Service Task Lists

System developers will therefore have systematic analysis requirements

System developers will have a more tractable analysis effort

System developers can make their own determination on the level of detail of their analysis - there is no arbitrary aggregation of system processes or performance parameters



The Basic Concept: MOEs vs MOPs

MOP's

Detection Range
Speed
Take-off Weight
Radar Cross Section
CEP
Satellite Orbit
Range

System/ Engagement Level Analyses

MOE's

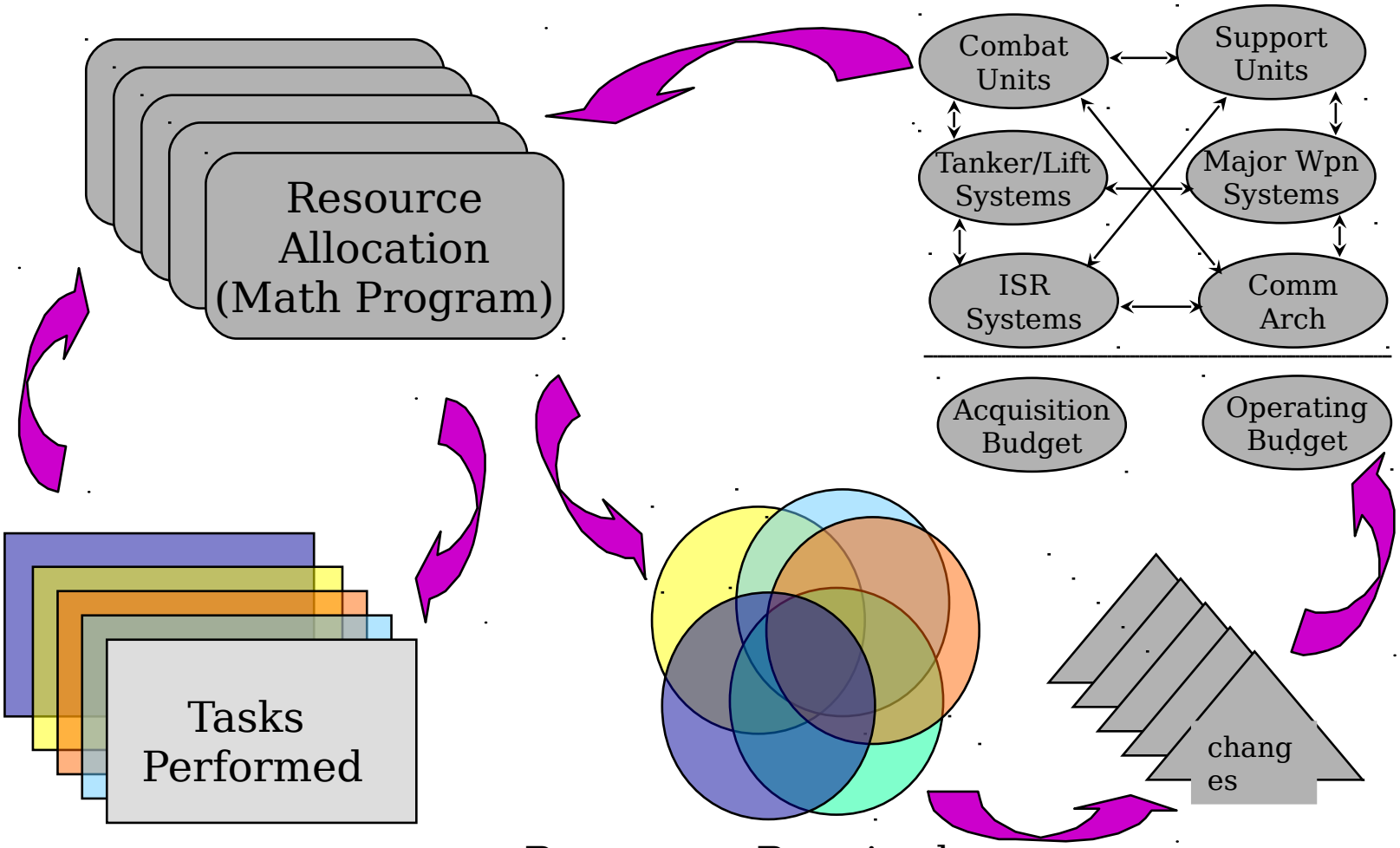
PERCENT TASK COMPLETED BY A SINGLE SYSTEM					
	SYS #1	SYS #2	SYS #3		SYS #N
TASK #1	10%	N/A	35%		80%
TASK #2	45%	70%	100%		35%
TASK #3	60%	15%	30%		N/A
TASK #4	N/A	N/A	40%		N/A
TASK #5	20%	N/A	40%		65%
TASK #M	40%	100%	50%		20%

PERCENT RESOURCE CONSUMED BY TASK					
	SYS #1	SYS #2	SYS #3		SYS #N
TASK #1	2%	N/A	4%		7%
TASK #2	4%	3%	1%		3%
TASK #3	100%	100%	100%		N/A
TASK #4	N/A	N/A	40%		N/A
TASK #5	1%	N/A	40%		6%
TASK #M	3%	12%	4%		2%

System/Unit Effectiveness by Task

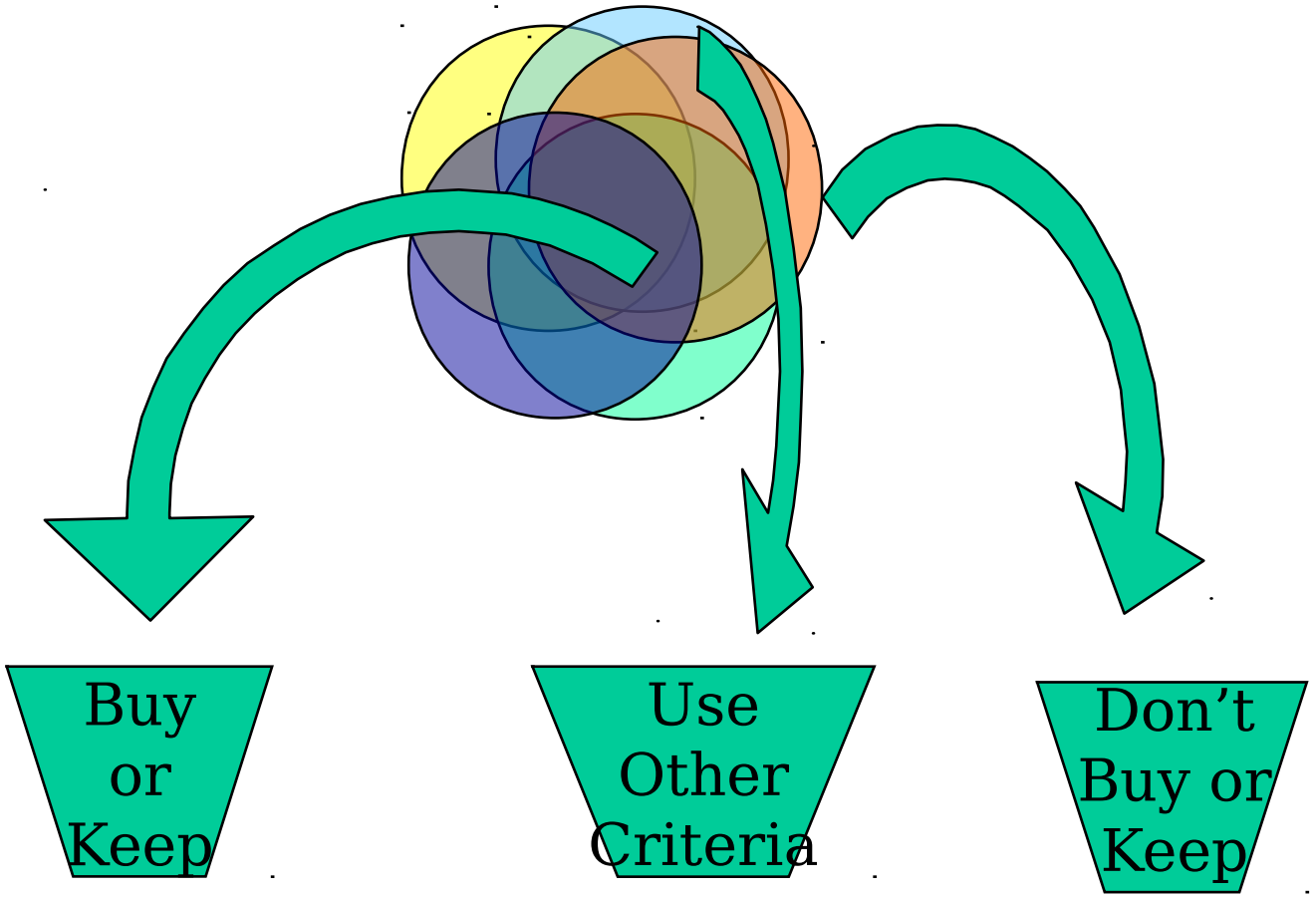
The Basic Concept

Force Structure Analyst Perspective



The Basic Concept

Force Structure Analyst Perspective



Typical Parametric Trade-offs
Systems Effectiveness Parameters

Weapon Systems and Units

Effectiveness performing each task
Attrition rate performing each task
Daily Utilization Rate/Availability
Munitions Load
Refueling needs
System Acquisition and Operating Costs

ISR Systems

Number of entities detected per system day (by entity type)

Number of entities classified per system day (by entity type)

Number of classifications possible per system- day (by entity type

Attrition Rate
System Acquisition and Operating Costs

Typical Parametric Trade-offs
Systems Effectiveness Parameters

Communication Nodes

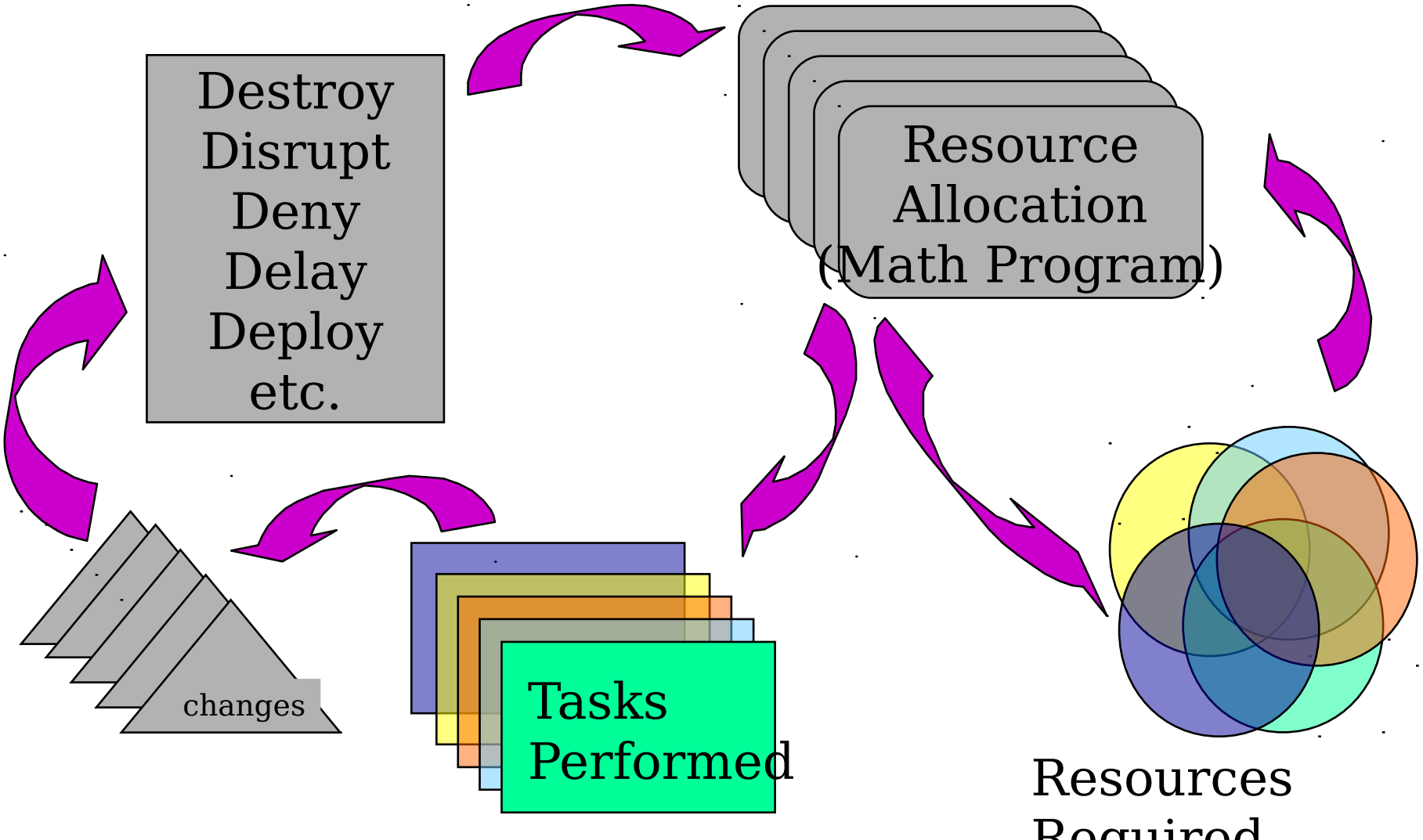
- Node Capacity (for multiple activities)
- Segment Capacity
- Amount of time for information to travel across a node under ideal
- Amount of time for information to travel over a segment under idea
- Level of operation of nodes by category
- Level of operation of segments by category (i.e. VHF)
- Level of operation of individual nodes and segments
- Information routing options by target type
- Node or Segment Costs

Lift and Tanker Systems

- Number of lift and tanker assets by type
- Lift capabilities by lift type
- Refueling capabilities by type
- Refueling needs by lift type
- System Acquisition and Operating Costs

The Basic Concept

Operational Planner Perspective



Typical Parametric Trade-offs
Scenario and Art of War Parameters

Concept of Operations

Different tasks and/or priority of each task (represents different Concepts of Operation)

Minimum acceptable levels of task(s) performed

(e.g. . Minimum number of CC targets destroyed during 1st time period)

Maximum acceptable losses (Maximum levels of attrition etc.)

Theater/Scenario

Number of targets of each type in each distance band

Percent of targets which have significant value (estimate # of decoys and non- operational targets)

Number of systems (weapon, ISR, lift, communication etc.) in home inventory

Number of systems based in theater vs. in the CONUS

Size of theater and/or principle areas of interest

Expected weather patterns and terrain types

Budgetary

Acquisition Budget

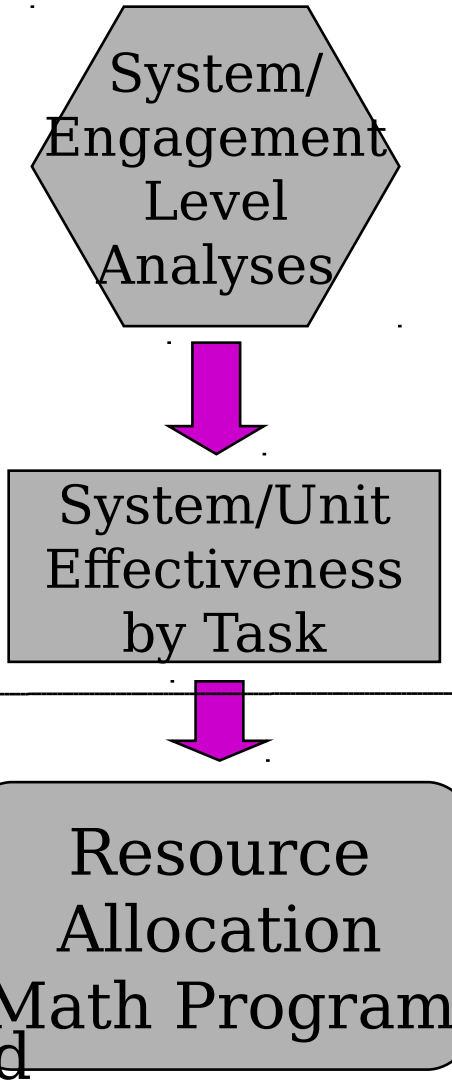
Operational Budget

Individual System (Weapon, Munitions, ISR, Lift, etc.) Acquisition

Information

Information During Execution

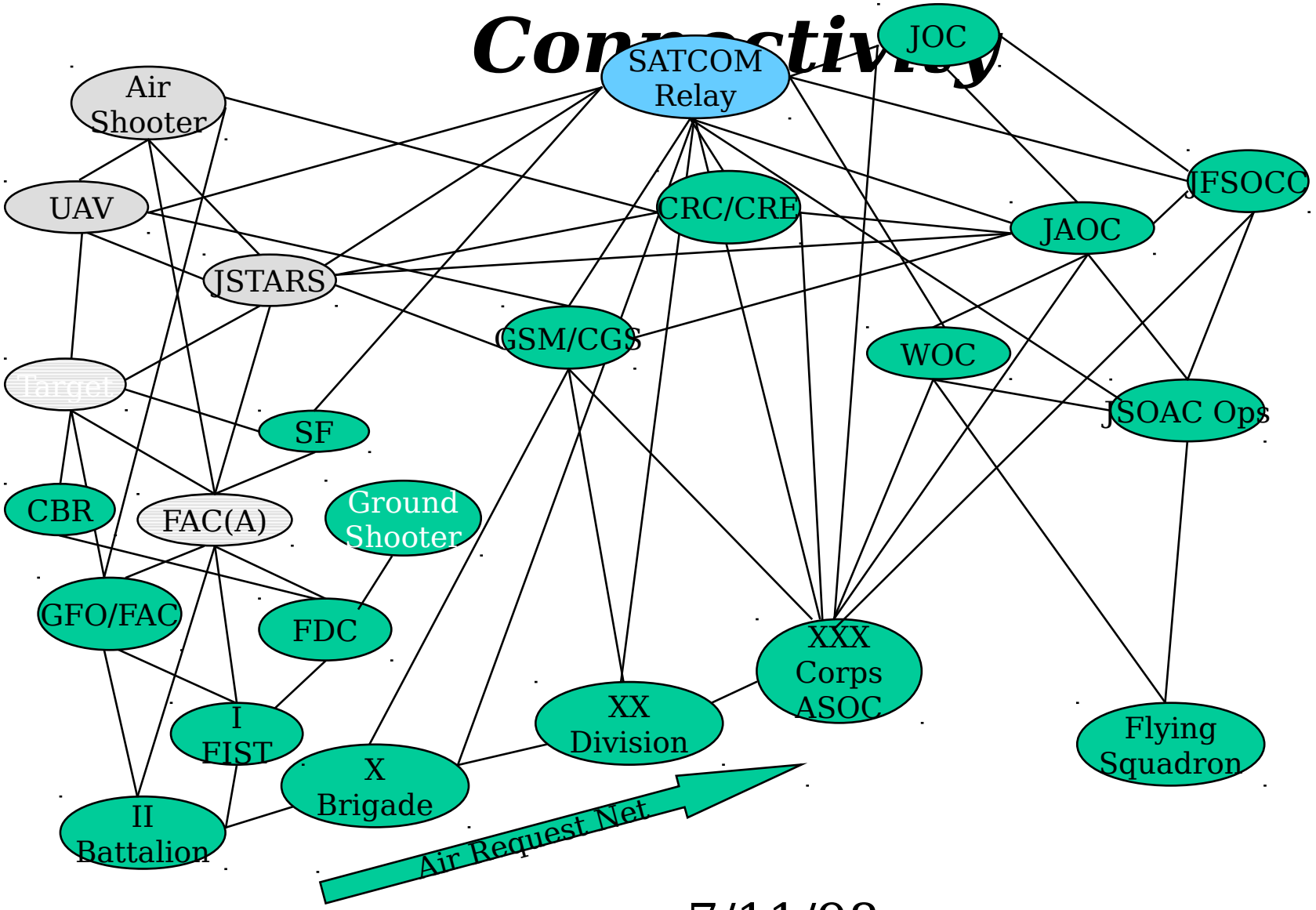
Information content and timing
after
the task has been initiated impacts
system/unit effectiveness



Information During Planning

Information content and timing
during
nning determines if a task can be initiated

Node Connectivity



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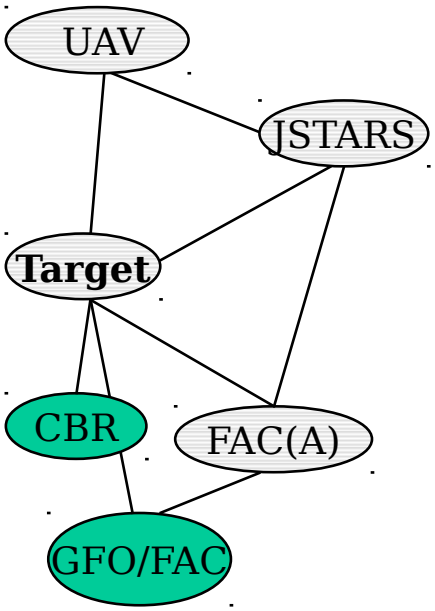
ISR Assets

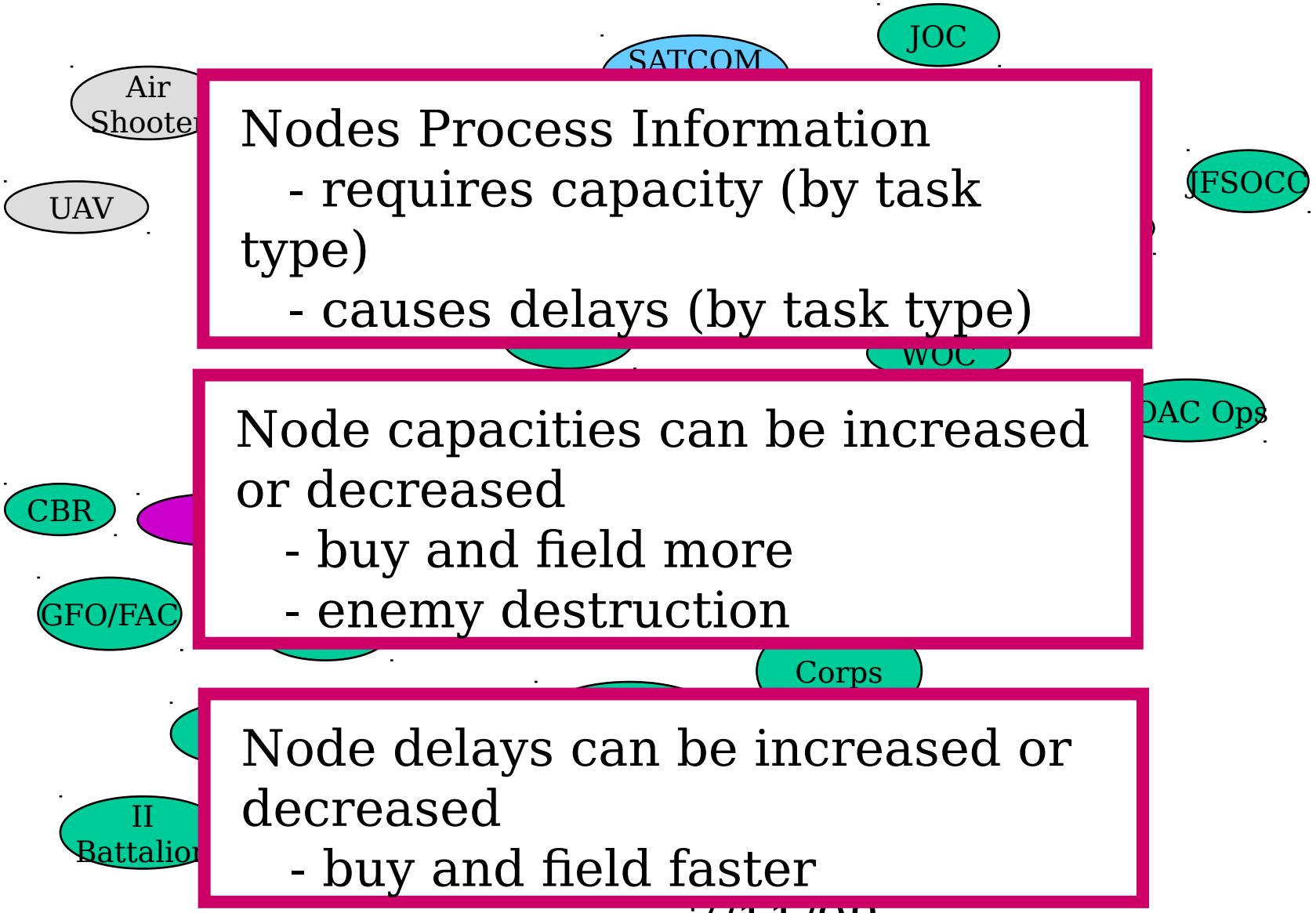


Detect/Gather/Collect - finding something and store raw data on i

Classify - identifying what that something is (e.g. a tank, enemy ord

Discriminate - figuring out if the thing is a real (valuable) entity (i.
operational systems that is not damaged and is not a decoy)

Nodes



Nodes Process Information
- requires capacity (by task type)
- causes delays (by task type)

Node capacities can be increased or decreased
- buy and field more
- enemy destruction

Node delays can be increased or decreased
- buy and field faster processors

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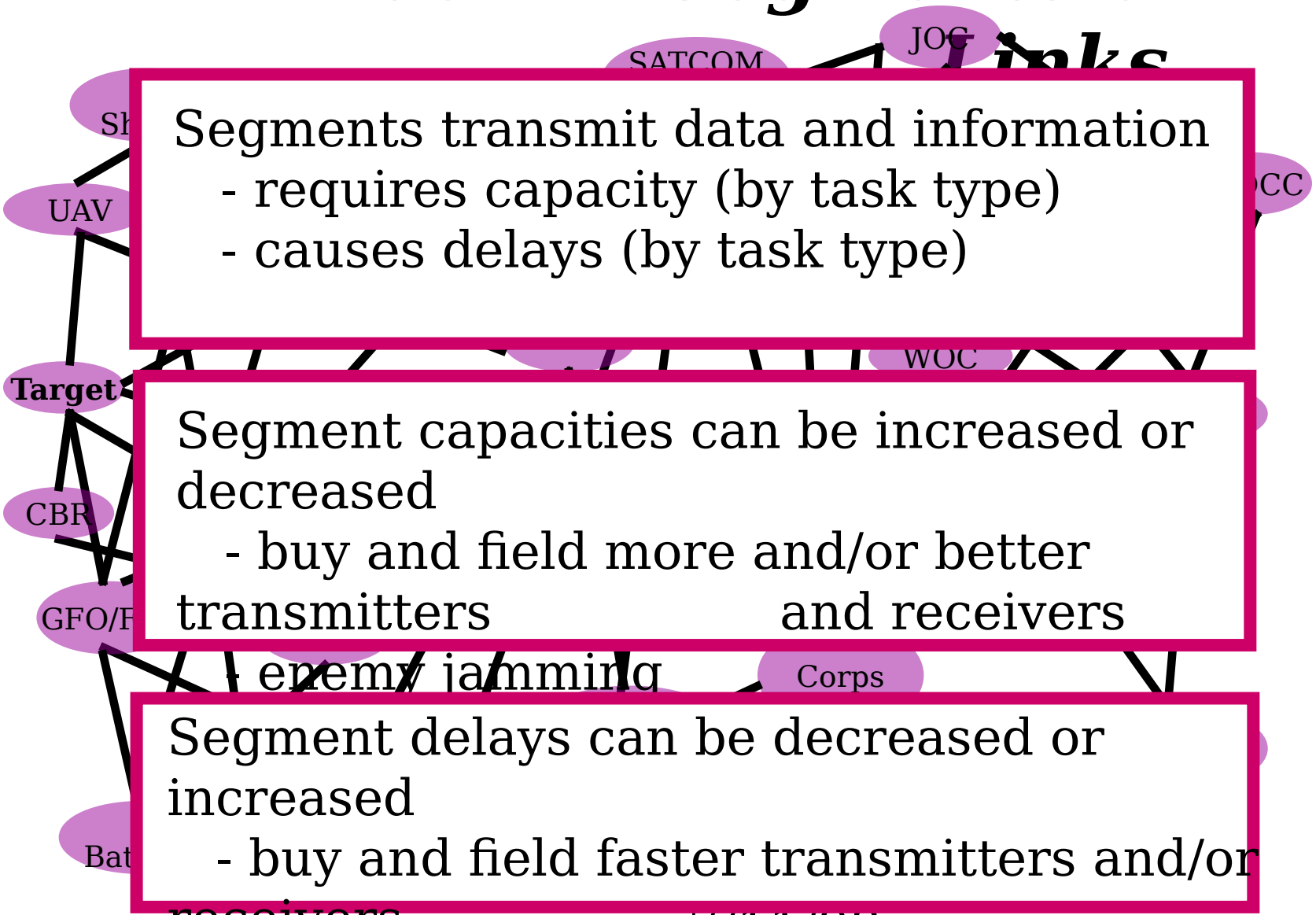
Comm Segments or Links

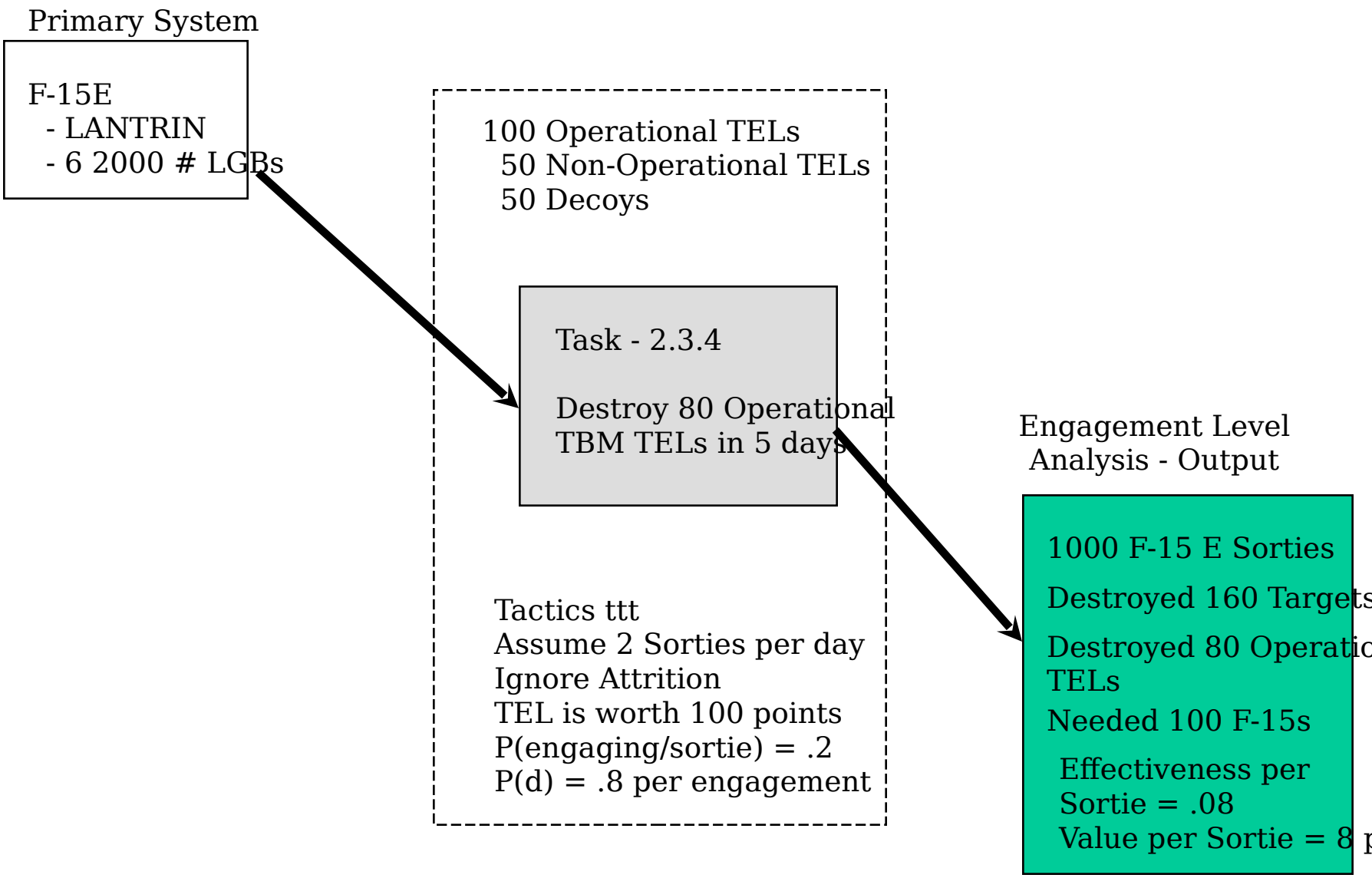


Segments transmit data and information
- requires capacity (by task type)
- causes delays (by task type)

Segment capacities can be increased or decreased
- buy and field more and/or better transmitters and receivers
- enemy jamming

Segment delays can be decreased or increased
- buy and field faster transmitters and/or receivers

Value of Information During Planning



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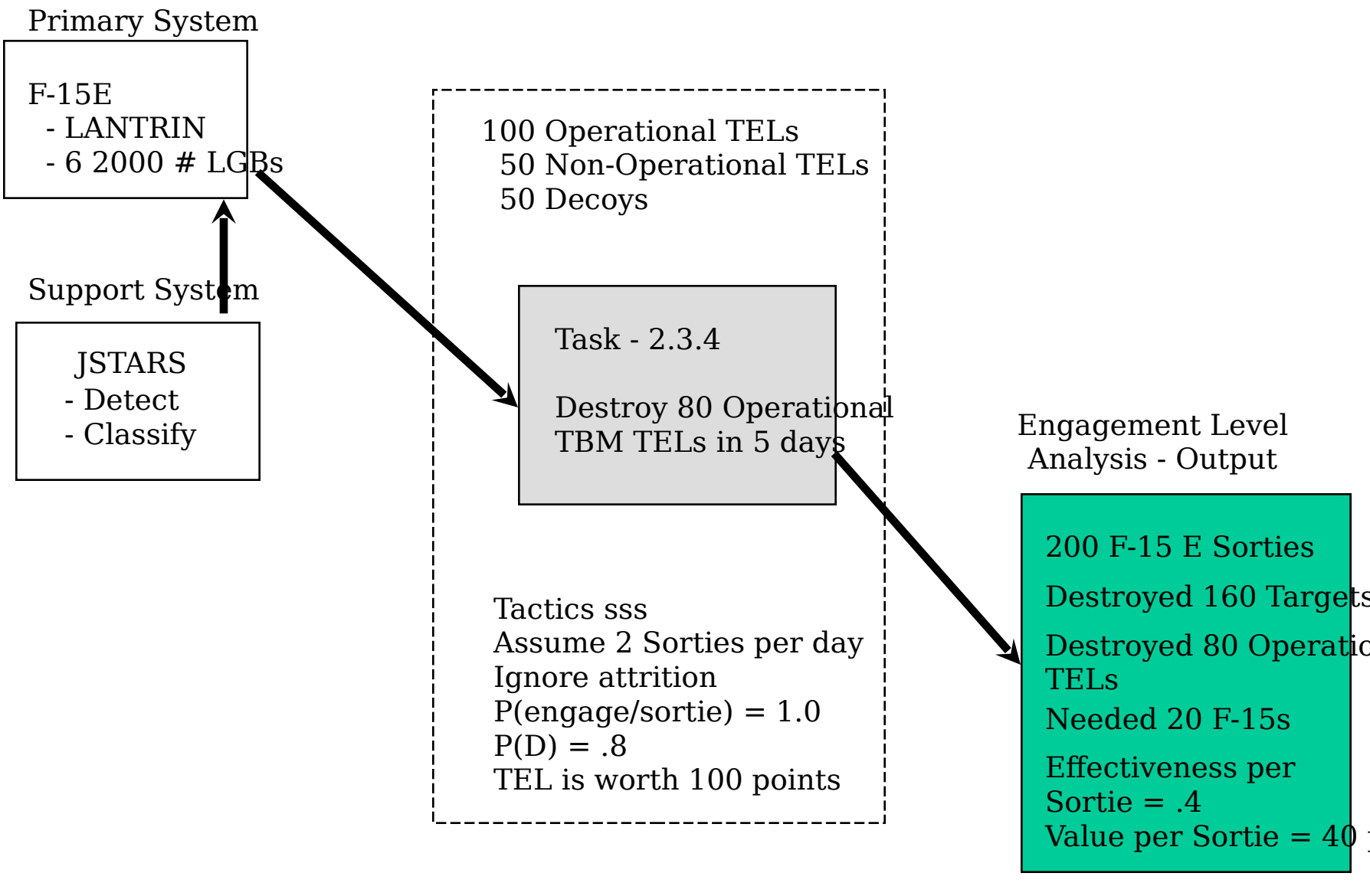

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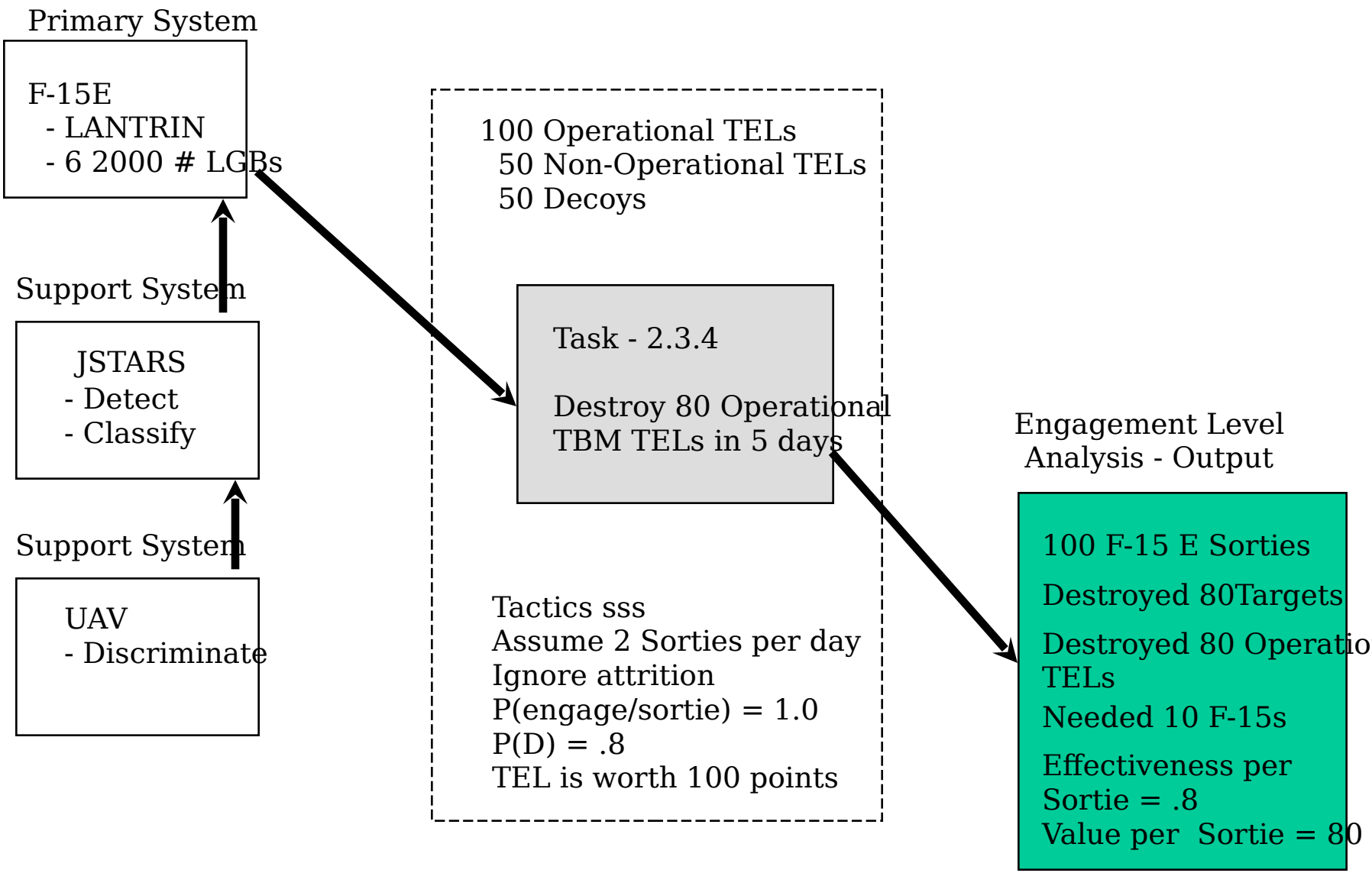


Ongoing Activities

Complete by end of 1998

- CID Study feasibility demonstration
  - developing a notional database
  - demonstrating application
- ID data sources
- Improve data entry methods
- ID hardware & software constraints

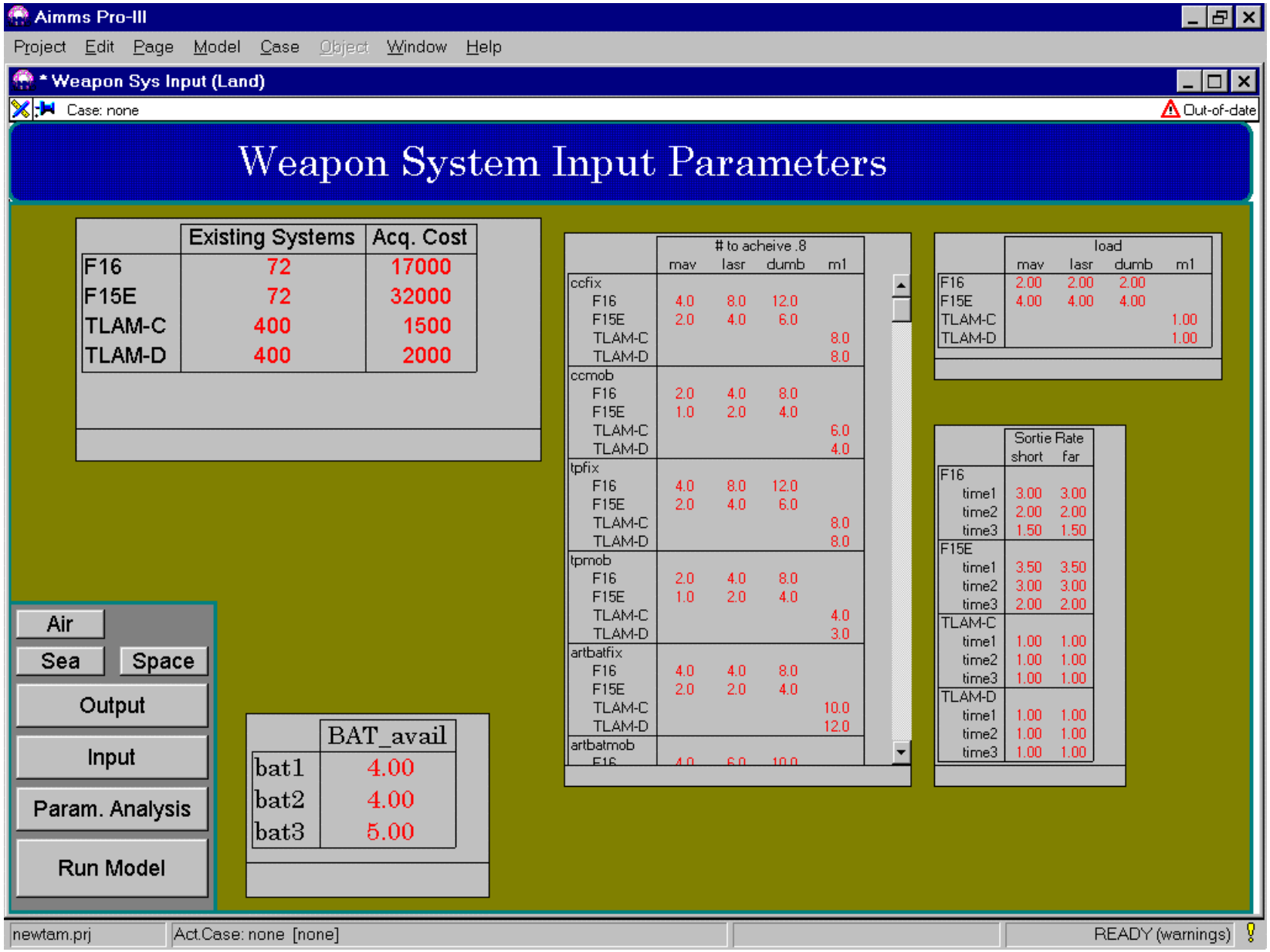
Future Activities

- Data Gathering/Updating 40%
- Data Management 25%
- Model Validation and Verification 10%
- User Interface Improvements 15%
- Model Enhancements 10%
- Utility Assessment
  - J-8 ?
  - CINC ?

"Technical" Priorities

- Work with a CINC's planning staff to establish a baseline set of TASKS and time requirements
- Work with the ISR community to ensure we have developed the right approach for allocating ISR assets
- Establish a baseline Communication Architecture and database
- Run large problems on high end PCs and UNIX systems

Sample Input Parameters



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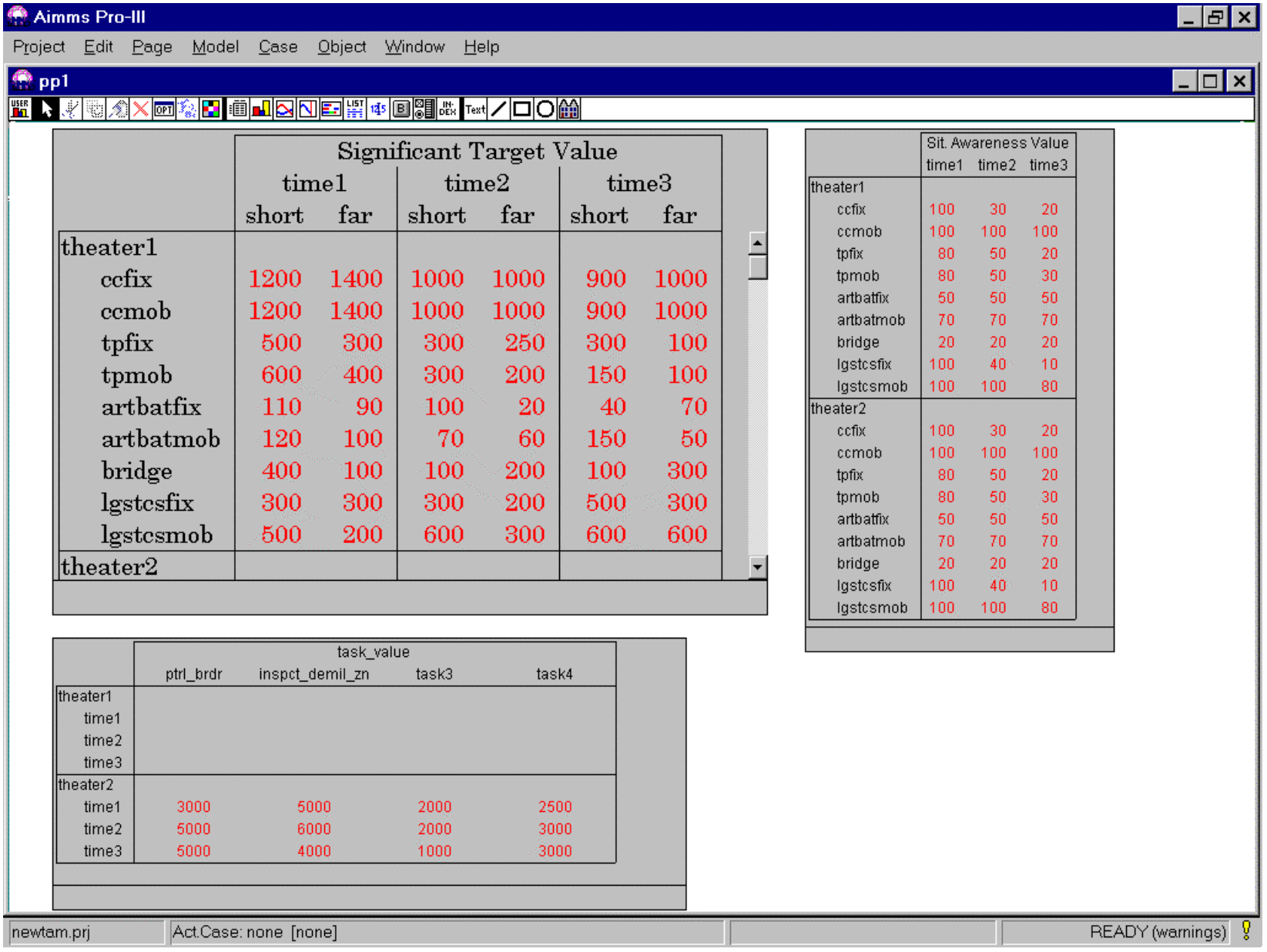

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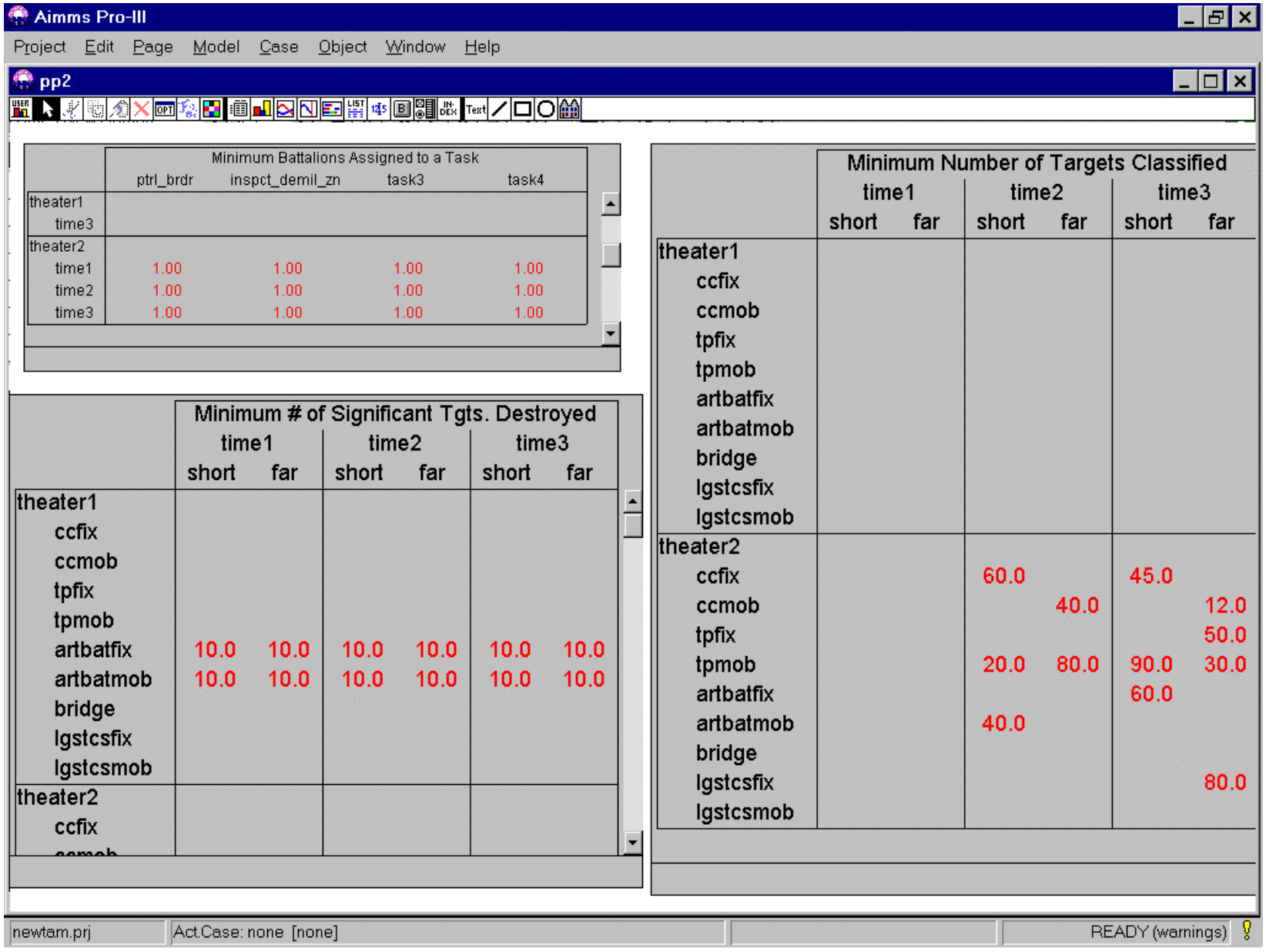


Cases Considered

BASE: Base Case

UAVUP: UAV GlobalHawk has its P(Discriminate) increased from 60% to 90%. (No discrimination means P(Disc) = 50%)

BUD50: Acquisition and operational budgets increased 50% over the base case.

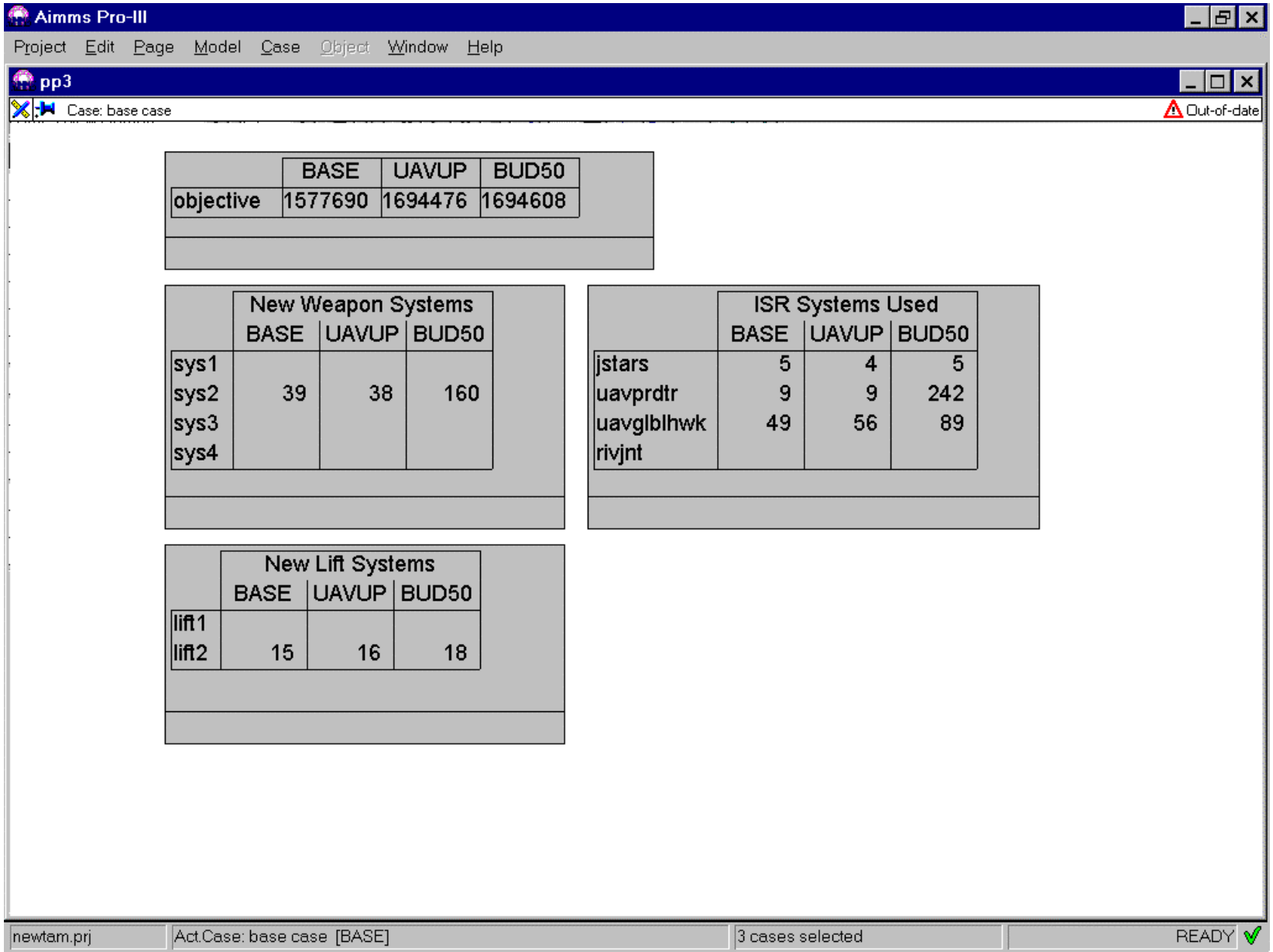
UAVSAT: Transmission from the UAV GlobalHawk to the SATCOMM link is reduced to 20% of its normal performance.

UAVSAT50: Same as UAVSAT except that acquisition and operational budgets are increased by 50%.

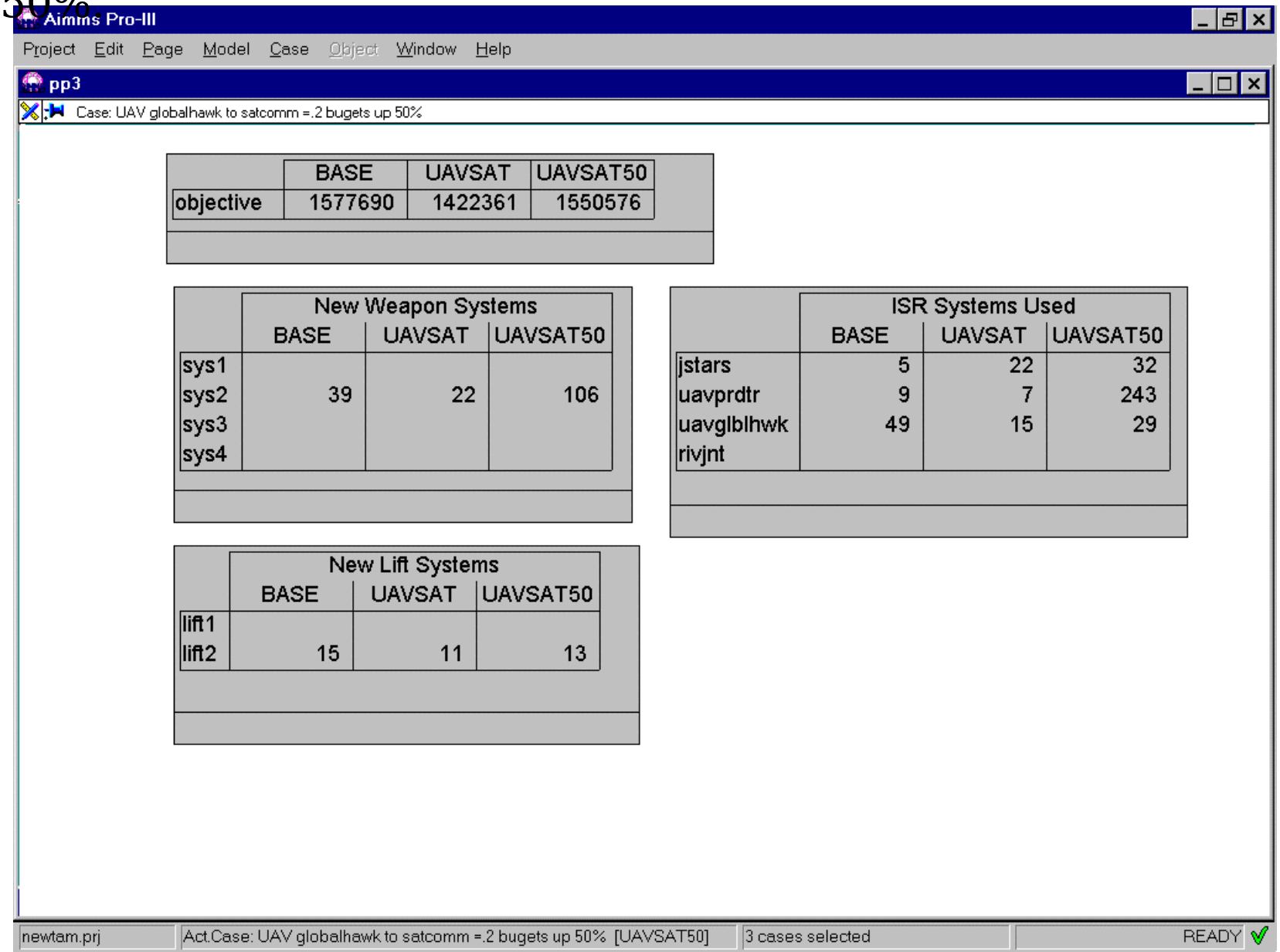
KU: All Ku-Band segments are reduced to 50% of normal performance.

KUwB: Same as KU, but acquisition and operational budgets are increased 100%.

Cases compared: Base case, GlobalHawk P(Disc) up 30%, and Base + 50% higher budgets.



Cases compared: Base case, Link between UAV GlobalHawk and SATCOMM degraded, Link degraded with budgets raised 50%



Cases compared: Base case, all Ku-band communication links degraded, all Ku-band links degraded along with 100% increase in budgets.